



## Agonistic and Acoustic behaviour of Sarus Crane, *Antigone antigone* in Gurugram District, Haryana, India

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### ABSTRACT:

Sarus crane, *Antigone antigone* is a sociable bird that have evolved to inhabit wetland areas. Sarus crane perform varieties of behaviours which may include egocentric, maintenance, agonistic and acoustic behaviours. Population of Indian Sarus crane is declining rapidly and now has been declared as a vulnerable species in IUCN red list of threatened species. However, there are limited studies focusing on habitat utilization, nesting, breeding success, and behavior of Sarus cranes. We studied the Sarus crane in the Gurugram District of Haryana, India to understand two types of behavioural activities that these birds usually perform in their daily life. In this study, we focus on two types of behaviour i.e. agonistic and acoustic behaviour of Sarus cranes. We proposed regular survey to monitor various activities of Sarus Crane that comes under agonistic as well as acoustic behaviour. Our analysis predicted that Sarus crane perform various activities during their lifetime depending on the condition that they face. Major threat display that we have noticed is tertial elevation and dorsal preening that they was performing maximum time during our observation. Our study revealed that these birds shows unison call as major acoustic display when they present in pair and with other pair as well. The present study was carried out in the Gurugram district of Haryana.

**Keywords:** Sarus Crane, Agonistic, Acoustic, time activity budget, Gurugram district

### INTRODUCTION

Sarus Crane, *Antigone antigone* is one of the non-migratory tallest flying crane among the 15 species of cranes which belongs to order *Gruiformes* and family *Gruidae* [1, 2, 3]. Like other cranes Sarus Crane is an open wetland species that are mainly confined to India and South east-asia. They form long-term pairs that mate and live together for their whole life and maintain their territories to perform different types of behaviours. Due to declining population [4] the species is currently listed as Vulnerable on the IUCN Red List of Threatened Species [5, 6]. They are sociable birds [7] and exist large flocks, especially during the non-breeding season [8].

Sarus crane shows a variety of behaviour patterns during the course of their lives such as agonistic displays, communal behaviour, egocentric behaviour, maintenance behaviour, acoustic behaviour, locomotory behaviour, breeding behaviour and social behaviour to maintain their health and life as well. According to some researchers [9] agonistic communications are aggressive encounters with in a species which are distinct from the violence between predator and prey that may damage to any participant

[10, 11]. Some activities like alerting, arching, bowing, attacking, escaping, ground sticking, back preening, leg preening, crouching, wing opening that comes under agonistic behaviour [12]. Agonistic displays usually shown by the resident male to warn other individual near the borders of their territory. Territoriality and defense of nest sites are the motive to display agonistic behaviour by an individual [13, 14, 15, 16].

Acoustic behaviour on the other hand is an integral part of bird communication and principally communicates with each other by means of visual and vocal signals [17]. However, there are limited studies has been done on habitat utilization, nesting, breeding success, and behavior of sarus cranes. The study was mainly focused on two special types of behaviours that these birds usually performed in their daily life i.e. agonistic and acoustic behaviour. It mainly includes the analysis of movements as well as displays involved in agonistic behaviour, and also an influence on social patterning and territoriality.

**MATERIALS AND METHODS**

The study was conducted in district Gurugram of south Haryana located at 28°28'N latitude and 77°02'E longitude. On north of district Gurugram is located district Jhajjar and the Union Territory of Delhi whereas district Faridabad lies to its east. The study area primarily consist of grasslands, wetlands, marshlands, agricultural land. This district also contains many small hill ranges which are part of the Aravali and Mangar Bani ranges. There are sites that we had selected for our study i.e. Sultanpur wildlife sanctuary, Najafgarh jheel Bird Sanctuary and Basai wetland. These are the home of many migratory bird species which stay here till the end of their favourable period.

Reconnaissance survey was made to gather preliminary information of Sarus preferred sites in the study area and intensive study area was selected. Body postures of the Sarus cranes were recorded by utilizing the scan and focal sampling methodology. Intensive study was carried out with regular field visit in the study area to achieve the various objectives of the study. During each sighting of Sarus crane physical and ecological

parameters were recorded such as time of sightings, number of individuals (group size), their age group (Adult/Juvenile), vegetation type where birds sighted, activities of the birds. Observation were made after fixed intervals to record different behavioural patterns of Sarus Crane by using scan sampling method [18]. Written observations, motion pictures, and recordings of vocalizations have also been taken to document agonistic and acoustic behavior patterns [19]. Various agonistic and acoustic behaviour patterns were studied to predict the influence of various factors upon the ethology of Sarus crane.

Observation were made by using Canon powershot SX60 camera, 10X50 Nikon binocular for long distance observation. Questionnaire surveys was also be made by local people that was mainly deals with the behaviour of Sarus Crane. The sound spectrogram (graphic representation of a sound also known as sonogram) was method to characterize acoustic signals on the basis of their frequency, duration and amplitude [17]. Spectrograms were made with the help of Praat window software.

Table 1. Agonistic and Acoustic behaviour of Sarus Crane

Agonistic Behaviour	Time (minutes) recorded in different activities by :		Acoustic behaviour	Time (minutes) recorded in different activities by :	
	Males	Females		Males	Females
Alert	4.32	1.46	Unison call	6.43	6.40
Arch	3.24	0.56	Flight call	2.24	2.20
Ruffle bow	2.48	2.06	Alarm call	3.42	2.35
pre attack	4.14	4.18	Communication call	6.87	5.45
Tertial elevation	6.56	4.28	Stress call	2.45	1.54
Dorsal preen	6.02	5.53	Location call	1.28	1.05

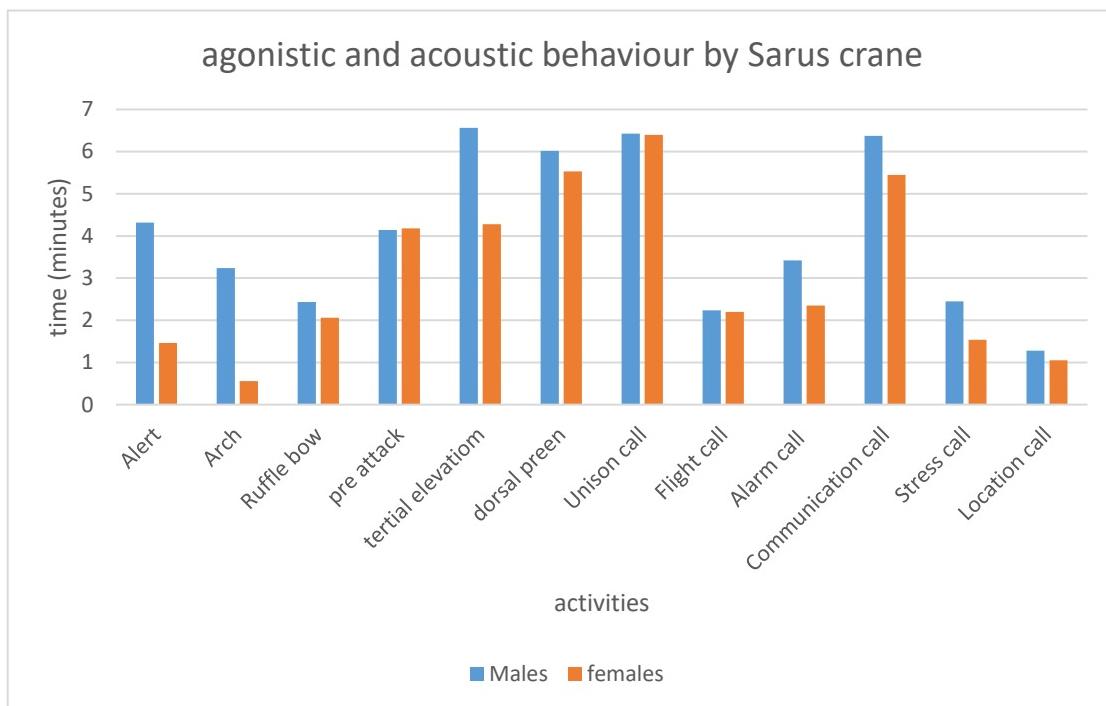


Figure 1. Time budget of various activities of agonistic and acoustic behaviour of Sarus Crane



Figure 2. pre- attack behaviour of Sarus crane



Figure 3. Sarus crane showing dorsal preen



Figure 4. Male Sarus display arching behaviour



Figure 5 Sarus crane showing bill down growl behaviour

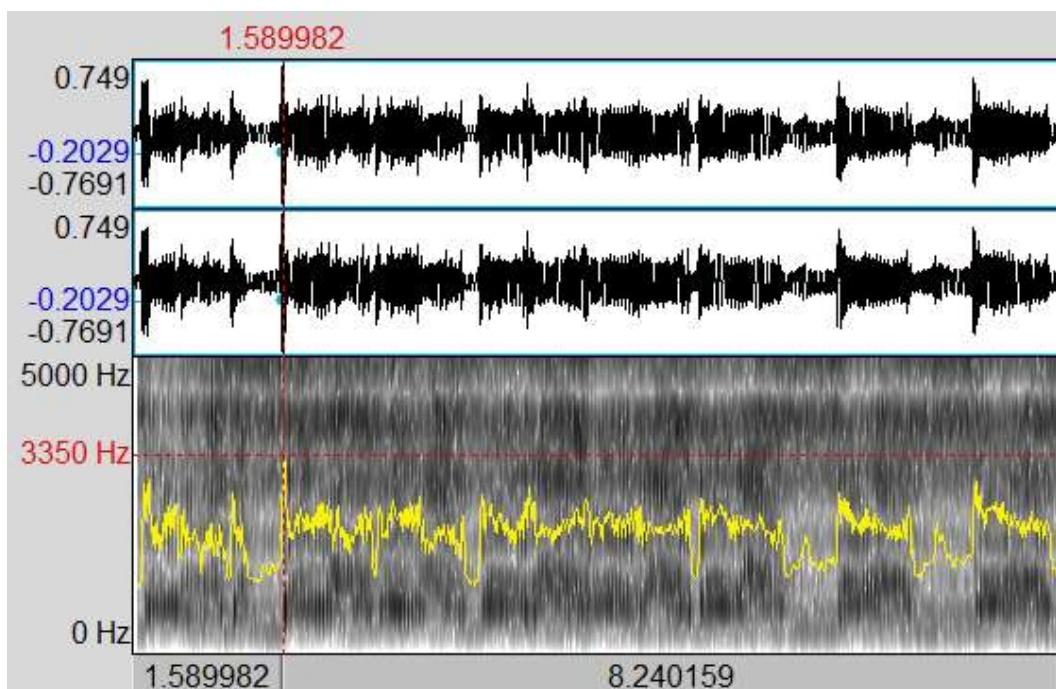


Figure 6. Spectrogram showing flight call by Sarus Crane

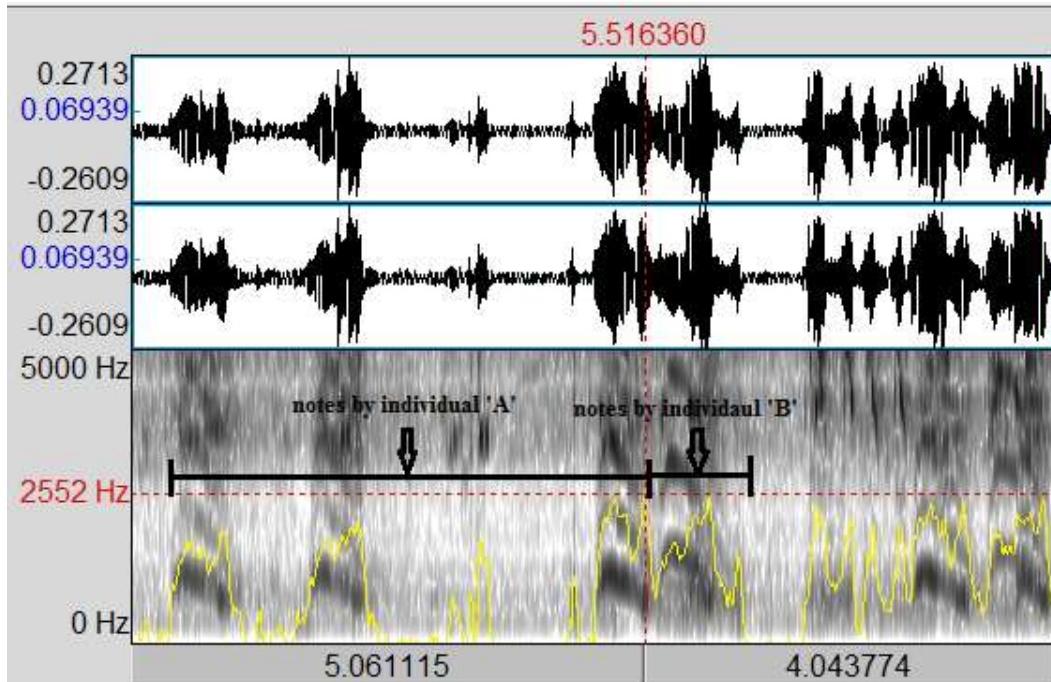


Figure 7. Spectrogram showing Communicative call by Sarus crane.

## RESULT

Two types of behaviours of Indian Sarus Crane i.e. agonistic behaviour that mainly includes alert, dorsal preen, arch, pre-attack, bill down growl and head rub and ruffle bow while acoustic behaviour that covers alarm call, unison call, flight call, communication call and call during foraging and feeding. Sarus crane show various agonistic activities towards other species or other pair of Sarus crane that was present near or in their territory while foraging. Table 1 shows that dorsal preen was a major agonistic display that Sarus crane performs maximum time during the study. In contrast to these various other threat displays, these birds gave some alarming stimulus as an acoustic behaviour, by extending their head up and fore ward. Males typically elevate the head higher while females extend the neck more forward. It has been observed that during this display adult males play a chief role in visualising any threats to the pair or family as compared to female Sarus Crane. Both male and female

spend minimum time in Ruffle bow agonistic display which was performed by the bird presenting one side toward the invader.

A part from agonistic behaviour various acoustic activities were also be observed. Sarus crane performs various calls during different agonistic activities depending on the conditions that they were facing. Unison call is a specific acoustic behaviour observed in Sarus crane. During this unison call both bird calls standing side by side with necks upright and, when highly aggressive, standing on tip toes to increase height and call for the duration determinate period i.e. 20-30 seconds continuously. During flight these birds called loudly with a very short interval as shown in figure 6. During unison call each node is composed of three different calling notes; middle part is performed by male Sarus crane that mainly call with some breaks (Fig. 6). Around every male call, female show a continuous short duration call with low frequency than that of male Sarus crane. Each



call of Sarus crane is composed of a series of hoarse sub notes that were given so rapidly that reaches upto 3254 Hz frequency which are given in figure 7. A very loud trumpet-like

It was observed that before an intruder in preparation for attack the crane spread and droop its wings so primary and secondary tips droop or touch the vegetation. The neck is extended upward and slightly forward with the head facing the intruder. It has also recorded that during this pre attack behaviour alarm-call also produced by these birds. The high-intensity arch usually follows several other, less intense, displays like dorsal preen performed by arching the neck over the back with the bill pointed. Simultaneously, the wings are lifted maximally above the back. The bird holds the pose one or more seconds, then lowers wings and returns bill to horizontal. This arching behaviour is mainly

During flight when moving from one place to another all members in a group of Sarus crane calls loudly without any interruption with a highest frequency of 3350 Hz. We have been observed that these birds continue to call loudly until they reach their foraging sites. During unison call male also elevated their wings and call after intervals while female Sarus crane was calling continuously. The Arch display shown by these birds usually followed by less powerful display i.e. dorsal preen in which the wings lifted maximally above the back. The bird holded the pose one or more seconds, then lowers wings and back their bill to horizontal. The present findings has revealed that these birds do unison call mainly when present in groups and each pair participate in this call one after the other. Our study has also been revealed that while communicating with other individual these birds made 2 to 3 calls regularly until receiver doesn't give call back to calling individual of Sarus crane. As shown in given figure 7 that individual 'B' gave a sudden call after 2 or 3 calls by individual A in a group of Sarus Crane. It also has noted that after

location call at least several seconds of silence follow each call were recorded during foraging.

performed my male of Sarus crane as shown in figure 5. The study revealed that dorsal preening is the most frequently performed non-static and social display in which they insert their beak into their back and tertiaries from dorsal side as shown in figure 4 we also observed that after a few seconds with the bill on back. Sarus crane frequently lifts their head to observe any type of threat or intruders and then returns back to preen position at the same spot. We also have noticed that dorsal preening display mainly begins with alert behaviour as an agonistic activity. During pre-attack behaviour of these birds male Sarus open their wings and moves with their mate foreward and ready to make intruder away from them.

communication these birds was moving away from any intruders or any threat around them. One another activity of Agonistic behaviour has been noticed during our study i.e. Bill down growl behaviour as shown in figure 4.

#### DISCUSSION

Sarus crane perform various behaviour in their life to fulfil their objectives. Some behaviours may include egocentric behaviour, maintenance behaviour, agonistic behaviour and acoustic behaviour. Our present study deals with two most important types of behaviour that Sarus crane performed according to their environmental conditions. Agonistic behaviour is a type of behaviour that is mainly related to aggression, threat, attack, appeasement, or flight. Our present study mainly deals with different activities of agonistic behaviours that mainly include alert, dorsal preen, arch, pre-attack, bill down growl and head rub and ruffle bow. As communication is an integral part of animal behaviour a part from agonistic behaviour these birds also performed various acoustic activities. These acoustic activities may include alarm call, unison call, flight call,

communication call and call during foraging and feeding. Out of various agonistic activities these birds spend maximum time in dorsal preening. During alert as well as arching display of agonistic behaviour male play a very important role and female stands near to their mate and male opens their wings to make intruder away from them. We have observed that Sarus crane shows various display behaviour that is protective, signaling danger at the approach of a predator. In some cases, the male and female both sing at the same time often with precise temporal coordination. This phenomenon is known as 'duet singing'. These birds mainly display unison call as an acoustic behaviour and spend maximum time in this type of calling and they spend very less time in location calls only at the time of foraging. Unisons call play an important role to determine sex in paired birds [20]. It has been observed that one mate in Sarus crane pair perform these bill down growl behaviour as shown in figure 40 only after an intruder approaching their territory. In cranes, raised-tertial posture was a major threat display as compared to other agonistic displays. In this posture the head with expanded crown, the bill become horizontal, and the tertial feathers are elevated to form a vertical fanlike shape. This display mainly followed by more intense threat signals. During this crane accomplishes a parade walk i.e. moving firmly about at a rate of about single step in a second, toward the threatened object or sometime in a circular manner around the threatened object. A unison call on which these birds spend most of their time during our study as both individual calling together in a pair to form an antiphonal duets [21] which are sexually dimorphic in all species except one species of cranes i.e. crowned cranes. Out of different calls these bird calls with very high frequency during flight from one place to another and flight call shown by every individual in the group of Sarus crane.

## CONCLUSION

Agonistic display is adaptive in conserving energy, making it necessary for the Sarus crane to chase intruders away. Sarus crane communicate with each other primarily by means of visual and vocal signals. Sound is an ideal method for communication over long distances. Acoustic signals play an important role in the life of birds in a variety of aspects like pair maintenance, parent-offspring interactions, attachment among flock or family members, and also during various situations of threats [17]. We have conclude that a part from various necessary behaviours these birds spend most of their time in agonistic as well as acoustic behaviour as they face many situation in their life.

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